METHODS OF SAMPLING AND TESTING
MT 215-04
DETERMINATION OF MOISTURE IN SOILS BY MEANS OF A CALCIUM CARBIDE GAS PRESSURE MOISTURE TESTER
(Modified AASHTO T 217)

1 Scope:

1.1 This method of test is intended to determine the moisture content of soils by means of a calcium carbide gas pressure moisture tester.

1.2 The following applies to all specified limits in this standard: For the purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded off "to the nearest unit" in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off method of AASHTO R 11, Recommended Practice for Indicating Which Places of Figures Are to Be Considered Significant in Specified Limiting Values.

Note 1 - This method shall not be used on granular materials having particles large enough to affect the accuracy of the test -- in general any appreciable amount retained on a 4.75 mm sieve. The super 200 D tester is intended to be used to test aggregate.

2 Referenced Documents:

2.1 ***AASHTO:***
T 217 Determination of Moisture in Soils by Means of a Carbide Gas Pressure Moisture Tester

3 Apparatus:

3.1 Calcium carbide pressure moisture tester.

3.2 Taped scale.

3.3 Two 1¼ inch (31.75) mm) steel balls.

3.4 Cleaning brush and cloth.

3.5 Scoop for measuring calcium carbide reagent.

4 Material:

4.1 Calcium carbide reagent.

Note 2 - The calcium carbide must be finely pulverized and should be of a grade capable of producing acetylene gas in the amount of at least 2.25 cu. ft./lb. (0.14 m³/kg) of carbide.

Note 3 - The "shelf life" of the calcium carbide reagent is limited, so it should be used according to the manufacturer's recommendations.

5 Procedure:

5.1 When using the 20 g or 26 g tester, place three scoops (approximately 24 g) of calcium carbide in the body of the moisture tester. When using the super 200 D tester to test aggregate, place six scoops (approximately 48 g) of calcium carbide in the body of the moisture tester.

Note 4 -Care must be exercised to prevent the calcium carbide from coming into direct contact with water.

5 Procedure: (continued)

5.2 Weigh a sample of the exact weight specified by the manufacturer of the instrument in the balance provided, and place the sample in the cap of the tester. When using the 20 g or 26 g size tester, place two 1¼" (31.75 mm) steel balls in the body of the tester with the calcium carbide.

Note 5 - If the moisture content of the sample exceeds the limit of the pressure gage (12 percent moisture for aggregate tester or 20 percent moisture for soil tester), a one-half size sample must be used and the dial reading must be multiplied by 2. This proportional method is not directly applicable to the dry weight percent scale on the super 200 D tester.

5.3 With the pressure vessel in an approximately horizontal position, insert the cap in the pressure vessel and seal the unit by tightening the clamp, taking care that no carbide comes in contact with the soil until a complete seal is achieved.

4.4 Raise the moisture tester to a vertical position so that the soil in the cap will fall into the pressure vessel.

5.5 Shake the instrument vigorously so that all lumps will be broken up to permit the calcium carbide to react with all available free moisture. When steel balls are being used in the tester and when using the large tester to test aggregate, the instrument should be shaken with rotating motion so the steel balls or aggregate will not damage the instrument or cause soil particles to become embedded in the orifice leading to the pressure diaphragm.

Note 6 - Shaking should continue for at least 1 min. with granular soils and up to 3 min. for other soils so as to permit complete reaction between the calcium carbide and the free moisture. Time should be permitted to allow dissipation of the heat generated by the chemical reaction.

5.6 When the needle stops moving, read the dial while holding the instrument in a horizontal position at eye level.

5.7 Record the sample mass and the dial reading.

5.8 With the cap of the instrument pointed away from the operator, slowly release the gas pressure. Empty the pressure vessel and examine the material for lumps. If the sample is not completely pulverized, the test should be repeated using a new sample. Clean the cap thoroughly of all carbide and soil before running another test.

Note 7 - When removing the cap, care should be taken to point the instrument away from the operator to avoid breathing the fumes, and away from any potential source of ignition for the acetylene gas.

5.9 The dial reading is the percent of moisture by wet mass and must be converted to dry mass. With the super 200 D tester, the dial reading is the percent of moisture by dry weight, and no further calculation is required.

6 Calculation:

6.1 The percentage of moisture by dry mass of the soil may be determined from the conversion curve. (Figure 1).

Note 8 - A conversion curve similar to Figure 1 is normally supplied with the moisture tester. However, each moisture tester should be checked for accuracy of its gage, or for the accuracy of the conversion curve. Accuracy of the tester gage may be checked by using a calibration kit (obtainable from the tester manufacturer), equipped with standard gage; in case of discrepancy, the gage on the tester should be adjusted to conform with the standard gage. For checking the

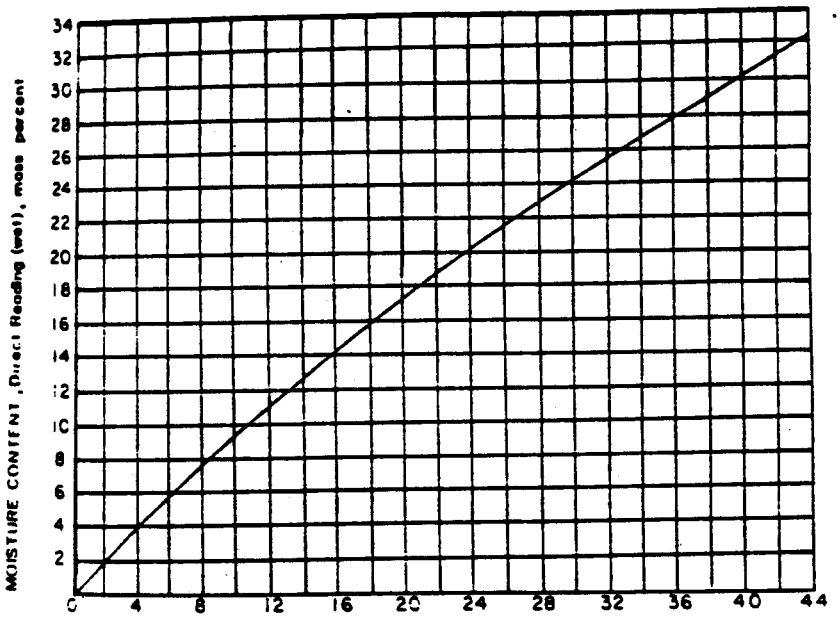
accuracy of the conversion curve, a calibration should be made for meter readings using locally

6 Calculation: (continued)

prepared soils at known moisture contents. Also additional testing may be necessary to extend the conversion curve (Figure 1) beyond 44 percent moisture content.

Note 9 - It may be more convenient for field use of the apparatus to prepare a table of moisture tester readings versus oven-dry moisture content for the moisture tester.

6.2 Determine the percentage of moisture to the nearest whole percent.



MOISTURE CONTENT, Oven Dry, Mass Percent

FIGURE 1 Conversion Curve for Moisture Tester Reading